

Patent claims

1. An inductive miniature component, especially an antenna, having a winding element that is configured as a flat, rectangular or many-sided part on which three windings are disposed in such a way that the axes of those windings extend in the three spatial directions (X, Y, Z) that are located at right angles relative to each other, whereby a first and a second winding, occupying the length and width of the winding element, are wound around the winding element in two directions that lie perpendicular to each other in the central plane of the winding element, and the third winding is wound around the winding element along its narrow side and following its periphery, whereby the winding element is at least partly composed of ferrite material and has, located on its bottom side, guide elements for guiding one side of the third winding, characterized by the following features:

a) The winding element (1, 11) has, on its top side, guide elements (1.5 through 1.8, 11.5 through 11.8) for guiding the other side of the third winding (2Z);

b) said guide elements (1.5 through 1.8) on the top side of said winding element (1) are composed of ferrite material

and are formed in one piece with said winding element (1)
which is composed of ferrite material;

5 c) said winding element (1) is placed onto and connected to a
coil plate (3) made of electrically non-conducting, non-
ferromagnetic material;

10 d) said coil plate (3) has recesses (3.1 through 3.4) that
extend over the thickness of said coil plate (3), whereby the
inner contour and the arrangement of said recesses (3.1
through 3.4) correspond to the outer contour and the
arrangement of the guide elements (1.1 through 1.4) that
are located on the bottom side of said winding element (1),
and whereby said winding element (1) is placed onto said
15 coil plate (3) in such a way that said guide elements (1.1
through 1.4) that are located on the bottom side of said
winding element (1) engage into said recesses (3.1 through
3.4) in said coil plate (3);

20 e) the ends (2.1X, 2.1Y) of the first and the second winding
(2X, 2Y) are respectively wound around said guide
elements (1.1 through 1.4) on the bottom side of said
winding element (1);

f) the ends (2.1Z) of said third winding (2Z) are respectively wound around corners or projections (3.5, 3.6) of said coil plate (3);

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2. A miniature component according to claim 1, characterized in that said guide elements (1.1 through 1.4) that are located on the bottom side of said winding element (1) are made of ferrite material and are formed in one piece with said winding element (1).

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3. A miniature component according to claim 1, characterized in that the guide elements (6.1, 6.2) that are located on the bottom side of said winding element (11) are made of polymeric material.

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4. A miniature component according to claim 3, characterized in that said guide elements (6.1, 6.2) that are located on the bottom side of said winding element (11) are, separately or in pairs, integrated into a part (6) of polymeric material, which is provided with at least one pin (7.1, 7.2) that extends upwardly and is introduced into a corresponding hole (5.1 through 5.4) that is located on the bottom side of said winding element (11).

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5. A miniature component according to one of the claims 1 through 4, characterized in that said guide elements (1.1 through 1.4 and 1.5 through 1.8, respectively) extend outwardly from the periphery of said winding element (1) and are arranged in such a way that, if viewed in a one circumferential direction, said guide elements (1.5 through 1.8) on the top side of said winding element (1) are each located essentially in front of one of the corners of said winding element (1), whereas the associated guide element (1.1 through 1.4) on the bottom side of said winding element (1) is located behind the pertaining corner.

6. A miniature component according to one of the claims 1 through 4, characterized in that the guide elements (11.1 through 11.4 and 11.5 through 11.8, respectively) extend outwardly from the periphery of said winding element (11) and that said guide elements (11.1 through 11.4) on the bottom side of said winding element (11) are located, in pairs, on two opposite sides of said winding element (11).

7. A miniature component according to one of the claims 1 through 6, characterized in that the thickness of the coil plate (3, 13) is equivalent to the thickness of the guide elements on the bottom side of said winding element (1, 11).

- 5 8. A miniature component according to one of the claims 1 through 7, characterized in that the recesses (3.1 through 3.4, 13.1 through 13.4) in said coil plate (3, 13) open towards the periphery of said coil plate.
- 10 9. A miniature component according to one of the claims 1 through 8, characterized in that the inner edges of said recesses (3.1 through 3.4, 13.1 through 13.4) in said coil plate (3, 13) and areas of a defined width adjacent to said recesses (3.1 through 3.4, 13.1 through 13.4) on the bottom and/or on the narrow side of said coil plate (3, 13) are provided with a metallic coating (4.1 through 4.4).
- 15 10. A miniature component according to one of the claims 1 through 9, characterized in that the narrow sides and/or adjacent areas of a defined width, on the bottom of said corners or projections (3.5, 3.6) of said coil plate (3) around which said ends (2.1Z) of said third winding (2Z) are wound, are provided with a metallic coating (4.5, 4.6).
- 20 11. A miniature component according to one of the claims 1 through 10, characterized in that said guide elements (1.1 through 1.4) that are located on the bottom of said winding

element (1) are configured as hook-shaped feet that extend outwardly.

12. A miniature component according to one of the claims 5 through 10, characterized in that said guide elements (1.5 through 1.8) on the top side of said winding element (1) each have a projection that extends, transverse to their longitudinal direction, over the adjacent corner.

13. Procedure for the manufacture of an inductive miniature component according to claims 2, 9 and 10, characterized by the following operational steps that take place automatically:

a) Providing a winding element composed of ferrite material with guide elements arranged on the top and on the bottom side that are formed in one piece with the winding element;

b) Winding a first and a second winding onto the winding element in two directions that lie perpendicular to each other and parallel to the central plane of the winding element;

c) Winding the ends of the applied windings around the guide elements on the bottom side of the winding element;

- d) Application of a glue onto defined areas on the bottom side of the winding element;
- 5 e) Providing a coil plate with recesses associated to the guide elements on the bottom side of the winding element;
- f) Joining the winding element and the coil plate;
- 10 g) Winding a third winding along the narrow side of the winding element into the space between the guide elements on the top side and the guide elements on the bottom side or the surface of the coil plate;
- 15 h) Winding the ends of the third winding around corners or projections of the coil plate;
- i) Connecting the ends of the windings with metallic coatings of the coil plate by soldering;
- 20 j) Removal of the component for measuring and packing.

14. Procedure for the manufacture of an inductive miniature component according to claims 3 or 4 in conjunction with 9 and

10, characterized by the following operational steps that take place automatically:

- 5 a) Providing a winding element composed of ferrite material with guide elements arranged on the top side that are formed in one piece with the winding element;
- b) Application of a glue onto defined areas on the bottom side of the winding element;
- 10 c) Providing guide elements composed of polymeric material and attachment of those guide elements on the bottom side of the winding element;
- 15 d) Winding a first and a second winding onto the winding element in two directions that lie perpendicular to each other and parallel to the central plane of the winding element;
- 20 e) Winding the ends of the applied windings around the guide elements on the bottom side of the winding element;
- f) Application of a glue onto defined areas on the bottom side of the winding element;

- g) Providing a coil plate with recesses associated to the guide elements on the bottom side of the winding element;
- 5 h) Joining the winding element and the coil plate;
- i) Winding a third winding along the narrow side of the winding element into the space between the guide elements on the top side and the guide elements on the bottom side or the surface of the coil plate;
- 10 j) Winding the ends of the third winding around corners or projections of the coil plate;
- 15 k) Connecting the ends of the windings with metallic coatings on the coil plate by soldering;
- l) Removal of the component for measuring and packing.

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